



NASA Exploring Space Challenges, where today's students are tomorrow's explorers. Encourage students to create, design, research and use technology at <http://esc.nasa.gov>.

## Mission: Teacher Challenge – International Polar Year

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**Grade Levels:** K-12 Pre- and in-service teachers

**Focus Question:** Can you design a scientific inquiry challenge for your students using the topic of our polar regions?

### INTRODUCTION



The International Polar Year is a large scientific program focused on the Arctic and the Antarctic from March 2007 to March 2009. Why two years, you may ask? So that researchers have full and equal coverage of both the Arctic and the Antarctic for two full annual cycles. The IPY effort will involve over 200 projects, with thousands of researchers from over 60 nations examining a wide range of physical, biological and social research topics. NASA's involvement in polar science is vast. From the use of satellites in space, NASA can aid scientists with monitoring the current and future health of our planet's polar regions. Continuous satellite records made possible only since the founding of NASA half a century ago are revealing where and how the poles influence global environmental change. NASA airborne and robotic technologies let scientists study extreme environments that are otherwise inaccessible. Furthermore, what NASA can learn about life in an extreme environment in our own polar regions will help us better understand the polar regions of the Moon and Mars for future exploration.

NASA recognizes that teachers are our greatest resource for reaching today's youth. We need **YOU** to encourage students to pursue careers in math, science, technology, engineering and geography. Integration and inquiry are the current methods believed to be most effective in achieving success with students. NASA Exploring Space Challenges (NASA ESC) would like to give you, the teacher, an opportunity to show your work. Perhaps you already teach a segment on the polar regions, whether in geography, earth science, biology or even physical science. Or perhaps you would like to create an activity from scratch. Either way, adapt your activity into the NASA ESC template and perhaps your Challenge will be selected for next year's line-up.

Teachers may submit their work alone or in groups to design a Challenge. Judges will select the best Challenges per each grade category (K-2, 3-5, 6-8, and 9-12). One winning Challenge(s) will be used by NASA ESC for the next school year. Credit will be given to the author of the selected Challenge.

## CHALLENGE REQUIREMENTS

### *Pre-Challenge Requirements*

1. **Online teacher registration.** A teacher can register by emailing [nasa-esc@nasa.gov](mailto:nasa-esc@nasa.gov). Each registered participant will receive a packet of NASA materials.
2. **Pre-assessment.** A brief assessment is to be completed by participants. This is for NASA ESC evaluation purposes only.

### *Objective One*

- Review other NASA Exploring Space Challenges. Explore NASA's involvement with the International Polar Year. Try an already published activity with your students to raise their awareness of our polar regions.
- Review last year's winning Teacher Challenge: **Mission: Hurricanes!**

### *Objective Two*

- **Participate in a NASA Digital Learning Network event.** Currently scheduled for October, the NASA ESC will offer a 30 minute event for registered participants to learn more about Arctic science, NASA's missions for IPY, then to participate in a hands-on activity. This event will also be aired via webcast for those who do not have the capabilities to videoconference.

### *Objective Three*

- **Write your proposal to the template! Challenges must contain the following:**
  - a. The NASA Exploring Space Challenges format must be used. (see next page)
  - b. Pre-challenge / warm-up activity
  - c. Interactive – implement a videoconference or create some other multimedia event.
  - d. NASA resources, websites and materials needed
  - e. Scoring rubrics for the appropriate grade category
  - f. National standards that incorporate a range of curricula (NSTA, NCTM, etc)
  - g. Pre and post assessment questions for participating students and teachers.

### *Post-Challenge Requirements*

1. **Online submission of Challenge guide/proposal.** Participants can email their proposals to [nasa-esc@nasa.gov](mailto:nasa-esc@nasa.gov).
2. **Post assessment.** A post-Challenge assessment must be completed by participants. Again, this is for NASA ESC evaluation purposes only.
3. **Certificate of participation.** Each teacher participant to successfully complete all requirements of this Challenge (including both assessments) will receive a certificate of participation.

## CHALLENGE TIMELINE

Event	Date
Registration open	June 1, 2007
DLN Event / Webcast	October TBD, 2007
Proposals due	January 4, 2008
Reviews process by judges	January-February, 2008
Selection of Winner Announced	March 7, 2008

## THE TEMPLATE



**Grade Levels:** *What grade level(s) is your activity designed for?*

**Focus Question:** *Please design one overall question that can be answered by following through with this activity.*

**Instructional Objectives:** *Please fill in three to six of your Challenge's instructional objectives.*

**National Standards:** Here are some example standards often covered in the NASA Exploring Space Challenges:

### *Science:*

- *Science as Inquiry - Students should develop:*
- *Abilities necessary to do scientific inquiry*
- *Understandings about scientific inquiry*
- *Understandings about science and technology*

### *Math:*

- *Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them*
- *Apply appropriate techniques, tools, and formulas to determine measurements*

### *Technology:*

- *Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity*

### *Language Arts:*

- *Reading for Perspective*
- *Developing research skills*

### *Geography:*

- *How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective*

**Introduction/Background:** *What information can you provide participants with to entice them to do this project?*

## Challenge Requirements

**Pre requirements** - warm up activities and pre-assessment

**Objectives** — outlines the activity and includes interactive events.

**Post requirements** — collection of data, presentation of product and post-assessment.

## Resources

**Though many resources about our polar regions are through other government agencies (i.e. NSF) and educational institutions, this activity should use NASA resources in some format. Resources from joint collaborations with NASA are also encouraged.**

**Rubric:** *Include a simple scoring rubric needed to grade a student's submission to your IPY Challenge.*

## **SPECIFIC RULES FOR THE TEACHER CHALLENGE**

1. Only pre-service teachers and in-service teachers of grades K-12 may participate.
2. Teachers intending to participate must register to [nasa-esc@nasa.gov](mailto:nasa-esc@nasa.gov). Each registered participant will receive a packet of NASA material by mail.
3. Challenge proposals must be submitted electronically as a Word document (.doc) or Acrobat (.pdf).
4. Each document submitted to the NASA ESC project office must include last name and the challenge abbreviation in the title of the document, e.g., Smith\_TC.doc.
5. Images embedded in the document must be given credit from the site from which it was obtained. This can be listed on a separate page.
6. NASA ESC template must be utilized. This consists of a) Target Audience, b) Focus Question, c) Learning Objectives, d) National Standards met, e) Background information, f) Pre and post assessment questions, g) Pre-lesson activity, h) Activity, i) judging rubric, j) internet resource list.
7. A NASA resource must be utilized. Resources from joint collaborations with NASA are encouraged.
8. One proposal will be selected for NASA product review for implementation into the 2008-09 year. Author of winning proposal will receive a stipend of \$1000 from the University of Maryland, Baltimore County.

## SCORING RUBRIC

	<b>Excellent</b>	<b>Satisfactory</b>	<b>Poor</b>
<b>Focus Question</b>	Question fosters critical thinking about IPY	Question does not engage students to investigate IPY	Question does not connect the goal of the lesson (IPY) to the activity
<b>Instructional Activity</b>	Students of many learning styles and strengths can benefit from the activity.	Activity is accessible to student of more than one learning styles and strengths.	Activity is not accessible to students with different learning styles and strengths.
<b>Standards</b>	Key national standards are referenced and are relevant to the lesson.	Some relevant standards are referenced - too many or too few standards are included	Standards are not included and/or not relevant to the lesson.
<b>Assessment</b>	Assessment is clear, consise and <i>directly</i> relates to objectives and standards.	Assessment is clear, consise and relates to objectives and standards.	Assessment is vague and does not relate to objectives and standards.
<b>Grade Level Appropriateness</b>	The lesson is appropriate for the intended grade level		The lesson is not appropriate for the intended grade level
<b>Creativity</b>	The lesson is orginial and includes engaging activities		The lesson lacks orginial and includes engaging activities
<b>NASA Resources</b>	Many NASA resources, materials and websites are included in the lesson.	Some NASA resources, materials and websites are included in the lesson.	NASA resources, materials and websites are not included in the lesson.
<b>Format</b>	Lesson completely follows the format given in the challenge template	Lesson somewhat follows the format given in the challenge template	Lesson does not follow the format given in the challenge template
<b>Required Elements</b>	Educator participates/completes ALL required components (DLN, assessments, etc)	Educator participates/completes some of the required components (DLN, assessments, etc)	Educator does not participates/completes in required components (DLN, assessments, etc)

## INTERNET RESOURCES

*These are some web-related resources for you to start with. We expect you will have your own list of resources (some of these sites may be repeated) tailored to your own challenge.*

### **NASA's involvement with International Polar Year**

<http://www.nasa.gov/IPY>

[http://www.nasa.gov/mission\\_pages/IPY/multimedia/index.html](http://www.nasa.gov/mission_pages/IPY/multimedia/index.html)

<http://eol.jsc.nasa.gov/IPY/>

### **Official International Polar Year website**

<http://www.ipy.org>

### **NASA Press releases of interest**

[http://www.nasa.gov/home/hqnews/2005/jul/HQ\\_05175\\_sea\\_level\\_monitored.html](http://www.nasa.gov/home/hqnews/2005/jul/HQ_05175_sea_level_monitored.html)

[http://www.nasa.gov/mission\\_pages/station/science/polar\\_year.html](http://www.nasa.gov/mission_pages/station/science/polar_year.html)

[http://www.nasa.gov/mission\\_pages/IPY/snow/reindeer.html](http://www.nasa.gov/mission_pages/IPY/snow/reindeer.html)

### **Things you can do with your students now**

<http://education.gsfc.nasa.gov/how/>

<http://schc.sc.edu/gopolar/ipy.htm>

<http://www.arctic.noaa.gov/education.html>

## ***Pre-Assessment IPY Teacher Challenge 2007***

Please complete this assessment before you begin work on your Challenge proposal. You will be asked to complete a post-assessment at the completion of this Challenge.

**Your name:**

**School name:**

**School address:**

Please select which statement is true.

My school is a NASA Explorer School.	
My school is <b>not</b> a NASA Explorer School.	

How many years of teaching experience do you have?

What subjects have you taught?

What grade level and subjects are you teaching this school year?

### ***Use of Challenges***

Have you participated in an NASA Exploring Space Challenges or any other NASA Challenge (i.e. NASA Engineering Design Challenge, STS-118 Design Challenge) before this one? If yes, please tell us which Challenge you participated in:

### ***Teaching about the Earth's polar regions***

Please select the number of days have you devoted to studying the polar regions in the past:

3 days or less	
6 – 10 days	
11-14 days	
> 2wks	



### ***Knowledge of Earth's polar regions***

How would you rate your knowledge of our polar regions and the research in those areas in the following categories, 1 being novice level and 5 being expert level.

Formation of polar ice (e.g. sea ice vs. land-fast ice)	0	1	2	3	4	5
Glaciers	0	1	2	3	4	5
Icebergs	0	1	2	3	4	5
Polynyas	0	1	2	3	4	5
Ice coring	0	1	2	3	4	5
Impact of global warming	0	1	2	3	4	5
Biology/Ecology involved in understanding	0	1	2	3	4	5
Geography involved	0	1	2	3	4	5
Related Careers	0	1	2	3	4	5
How would you rate your students' knowledge of polar regions?	0	1	2	3	4	5

### ***Knowledge of Technology***

How would you rate your knowledge of technology for learning about science in general?	0	1	2	3	4	5
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### ***Effect in teacher's curriculum***

To what extent does a polar-themed Challenge align with your curriculum standards?

Low correlation	0	1	2	3	4	5	High correlation
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### ***Effect on use of NASA materials and resources***

How much have you used NASA materials and resources in the past?

None	0	1	2	3	4	5	Several
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### ***Effect on Colleagues***

How likely is it that your colleagues will use the IPY Challenge Materials?

No chance	0	1	2	3	4	5	Extremely likely
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How likely is it that your colleagues will participate in the IPY Challenge next year?

No chance	0	1	2	3	4	5	Extremely likely
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How likely is it that your colleagues will participate in a different Challenge next year?

No chance	0	1	2	3	4	5	Extremely likely
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*Thank you for taking the time to complete this survey. We are using this data to improve our Challenges. We greatly appreciate your help and feedback.*